

IN THE CLAIMS

1. (currently amended) A floating-gate memory cell, comprising:
a gate stack having a control-gate layer and having a floating-gate layer
interposed between the control-gate layer and a first semiconductor region
having a first conductivity type;
a drain region in the first semiconductor region, wherein the drain region has a
second conductivity type different from the first conductivity type; and
a source region in the first semiconductor region and having the second
conductivity type;
wherein the source region is coupled to a second semiconductor region underlying
the first semiconductor region;
wherein the drain region is isolated from the second semiconductor region;
wherein the second semiconductor region has the second conductivity type; and
wherein the second semiconductor region isolates the first semiconductor region
from other semiconductor regions having the first conductivity type.
2. (original) The floating-gate memory cell of claim 1, wherein the source
region is coupled to the second semiconductor region through a conductive
source-line contact.
3. (withdrawn) The floating-gate memory cell of claim 2, further comprising a
conductive trace coupled between the source region and the source-line contact.
4. (withdrawn) The floating-gate memory cell of claim 3, wherein the conductive
trace is formed in the first semiconductor region.
5. (withdrawn) The floating-gate memory cell of claim 4, wherein the conductive
trace is a conductively-doped region formed in the first semiconductor region and
having the second conductivity type.

6. (withdrawn) The floating-gate memory cell of claim 4, wherein the conductive trace contains a metal silicide.
7. (withdrawn) The floating-gate memory cell of claim 3, wherein the conductive trace is formed on the first semiconductor region.
8. (withdrawn) The floating-gate memory cell of claim 2, wherein the source-line contact comprises a columnar trench of conductive fill material.
9. (withdrawn) The floating-gate memory cell of claim 2, wherein the source-line contact comprises an extended trench of conductive fill material and wherein the extended trench of conductive fill material is coupled to source regions of other floating-gate memory cells.
10. (original) The floating-gate memory cell of claim 2, wherein the source-line contact comprises a conductive fill material formed on sidewalls and a bottom of a contact hole and wherein the sidewalls of the contact hole are defined by the first semiconductor region and the bottom of the contact hole is defined by an exposed portion of the second semiconductor region.
11. (original) The floating-gate memory cell of claim 2, wherein the source-line contact comprises a conductive material and wherein the conductive material includes at least one material selected from the group consisting of an implanted conductively-doped region having the second conductivity type, a diffused conductively-doped region having the second conductivity type, conductively-doped polysilicon having the second conductivity type, a silicide, a polycide, a metal, a metal alloy, and a conductive metal oxide.

12. (original) The floating-gate memory cell of claim 1, wherein the first conductivity type is a p-type conductivity and the second conductivity type is an n-type conductivity.
13. (currently amended) A floating-gate memory cell, comprising:
a gate stack having a control-gate layer and having a floating-gate layer
interposed between the control-gate layer and a first semiconductor region
having a first conductivity type;
a drain region in the first semiconductor region, wherein the drain region has a
second conductivity type different from the first conductivity type; and
a source region in the first semiconductor region and having the second
conductivity type;
wherein the first semiconductor region is enclosed in a second semiconductor
region having the second conductivity type; and
wherein the source region is coupled to the second semiconductor region and the
drain region is isolated from the second semiconductor region.
14. (currently amended) A floating-gate memory cell, comprising:
a gate stack having a control-gate layer and having a floating-gate layer, wherein
the gate stack is overlying an upper well region and wherein the upper
well region has a first conductivity type;
a drain region in the upper well region, wherein the drain region has a second
conductivity type different from the first conductivity type;
a source region in the upper well region and having the second conductivity type;
and
a source-line contact extending from the source region to a lower well region;
wherein the lower well region has the second conductivity type; [[and]]
wherein the upper well region is formed in the lower well region[[.]]; and
wherein the drain region is not connected to the lower well region.

15. (canceled)
16. (currently amended) A floating-gate memory cell, comprising:
a tunnel dielectric layer overlying an upper well region, wherein the upper well region has a first conductivity type;
a floating-gate layer overlying the tunnel dielectric layer;
an intergate dielectric layer overlying the floating-gate layer;
a control-gate layer overlying the intergate dielectric layer;
a drain region in the upper well region, wherein the drain region has a second conductivity type different from the first conductivity type; and
a source region in the upper well region and having the second conductivity type, wherein the source region is coupled to a lower well region underlying the upper well region and having the second conductivity type[.];
wherein the lower well region is adapted to function as a source line.
17. (original) The floating-gate memory cell of claim 16, wherein the tunnel dielectric layer is overlying and in contact with the upper well region, wherein the floating-gate layer is overlying and in contact with the tunnel dielectric layer, wherein the intergate dielectric layer is overlying and in contact with the floating-gate layer, and wherein the control-gate layer is overlying and in contact with the intergate dielectric layer.
18. (original) The floating-gate memory cell of claim 16, wherein the source region is coupled to the lower well region through a conductive source-line contact.
19. (withdrawn) The floating-gate memory cell of claim 18, further comprising a conductive trace coupled between the source region and the conductive source-line contact.

20. (withdrawn) The floating-gate memory cell of claim 18, wherein the source-line contact comprises a columnar trench of conductive fill material.
21. (withdrawn) The floating-gate memory cell of claim 20, wherein the source-line contact is coupled to source regions of other floating-gate memory cells.
22. (withdrawn) The floating-gate memory cell of claim 18, wherein the source-line contact comprises an extended trench of conductive fill material and wherein the extended trench of conductive fill material is coupled to source regions of other floating-gate memory cells.
23. (original) The floating-gate memory cell of claim 18, wherein the source-line contact comprises a conductive fill material formed on sidewalls and a bottom of a contact hole and wherein the sidewalls of the contact hole are defined by the upper well region and the bottom of the contact hole is defined by an exposed portion of the lower well region.
24. (original) The floating-gate memory cell of claim 18, wherein the source-line contact comprises a conductive material and wherein the conductive material includes at least one material selected from the group consisting of an implanted conductively-doped region having the second conductivity type, a diffused conductively-doped region having the second conductivity type, conductively-doped polysilicon having the second conductivity type, a silicide, a polycide, a metal, a metal alloy, and a conductive metal oxide.
25. (currently amended) A memory device, comprising:
a substrate having a first conductivity type;
a lower well region in the substrate, wherein the lower well region has a second conductivity type different from the first conductivity type;

an upper well region in the lower well region, wherein the upper well region has the first conductivity type;

a plurality of word lines;

a plurality of bit lines; and

a plurality of floating-gate memory cells, wherein each floating-gate memory cell comprises:

- a control-gate layer for coupling to one of the plurality of word lines;
- a floating-gate layer interposed between the control-gate layer and the upper well region;
- a drain region in the upper well region for coupling to one of the plurality of bit lines, wherein the drain region has the second conductivity type;
- a source region in the upper well region, wherein the source region has the second conductivity type; and
- a source-line contact extending below the source region to the lower well region and providing electrical communication between the source region and the lower well region[.];

wherein the lower well region functions as a common source line for the plurality of floating-gate memory cells.

26. (withdrawn) The memory device of claim 25, wherein each source-line contact is laterally displaced from each source region and wherein each source-line contact is coupled to at least one source region.
27. (withdrawn) The memory device of claim 26, wherein each source-line contact is coupled to the at least one source region through a conductive trace.
28. (original) The memory device of claim 25, wherein each source-line contact extends through at least one source region.

29. (original) The memory device of claim 28, wherein each source-line contact extends through only one source region.
30. (withdrawn) The memory device of claim 25, wherein each floating-gate memory cell having a control-gate layer coupled to the same word line also shares the same source-line contact.
31. (currently amended) A memory device, comprising:
a substrate having a first conductivity type;
a lower well region in the substrate, wherein the lower well region has a second conductivity type different from the first conductivity type;
an upper well region in the lower well region, wherein the upper well region has the first conductivity type;
a plurality of word lines;
a plurality of bit lines; and
a plurality of floating-gate memory cells, wherein each floating-gate memory cell comprises:
a control-gate layer for coupling to one of the plurality of word lines;
a floating-gate layer interposed between the control-gate layer and the upper well region;
a drain region in the upper well region for coupling to one of the plurality of bit lines, wherein the drain region has the second conductivity type and is isolated from the lower well region;
a source region in the upper well region, wherein the source region has the second conductivity type; and
a source-line contact extending from the source region to the lower well region.
32. (currently amended) A memory device, comprising:
a substrate having a first conductivity type;

a first well region, wherein the first well region has the first conductivity type;
a second well region interposed between the substrate and the first well region,
wherein the second well region has a second conductivity type different
from the first conductivity type;
a plurality of word lines;
a plurality of bit lines; and
a plurality of floating-gate memory cells, wherein each floating-gate memory cell
comprises:
a control-gate layer for coupling to one of the plurality of word lines;
a floating-gate layer interposed between the control-gate layer and the first
well region;
a drain region in the first well region for coupling to one of the plurality of
bit lines, wherein the drain region has the second conductivity
type;
a source region in the first well region, wherein the source region has the
second conductivity type; and
a source-line contact extending below the source region to the second well
region and providing electrical communication between the source
region and the second well region[.];
wherein the second well region is not in electrical communication with the
drain region.

33. (currently amended) A memory device, comprising:
a substrate having a first conductivity type;
a first well region, wherein the first well region has the first conductivity type;
a second well region interposed between the substrate and the first well region,
wherein the second well region has a second conductivity type different
from the first conductivity type;
a third well region, wherein the third well region has the first conductivity type
and wherein the third well region is isolated from the first well region;

a fourth well region interposed between the substrate and the third well region,
wherein the fourth well region has the second conductivity type;
a first plurality of word lines;
a second plurality of word lines;
a plurality of bit lines;
a first block of floating-gate memory cells of a memory array, wherein each
floating-gate memory cell of the first block of floating-gate memory cells
comprises:
a control-gate layer for coupling to one of the first plurality of word lines;
a floating-gate layer interposed between the control-gate layer and the first
well region;
a drain region in the first well region for coupling to one of the plurality of
bit lines, wherein the drain region has the second conductivity
type;
a source region in the first well region, wherein the source region has the
second conductivity type; and
a source-line contact extending below the source region to the second well
region and providing electrical communication between the source
region and the second well region; and
a second block of floating-gate memory cells of the memory array, wherein each
floating-gate memory cell of the second block of floating-gate memory
cells comprises:
a control-gate layer for coupling to one of the second plurality of word
lines;
a floating-gate layer interposed between the control-gate layer and the
third well region;
a drain region in the third well region for coupling to one of the plurality
of bit lines, wherein the drain region has the second conductivity
type;

a source region in the third well region, wherein the source region has the second conductivity type; and

a source-line contact extending below the source region to the fourth well region and providing electrical communication between the source region and the fourth well region[.];

wherein the second well region is adapted to function as a common source line to the first block of floating-gate memory cells and the fourth well region is adapted to function as a common source line to the second block of floating-gate memory cells.

34. (original) The memory device of claim 33, wherein the second well region and the fourth well region are the same well region.
35. (original) The memory device of claim 33, wherein each control-gate layer coupled to each word line of the first plurality of word lines is associated with a floating-gate memory cell of the first block of floating-gate memory cells.
36. (withdrawn) The memory device of claim 33, wherein each source-line contact is laterally displaced from each source region and wherein each source-line contact is coupled to at least one source region.
37. (withdrawn) The memory device of claim 36, wherein each source-line contact is coupled to the at least one source region through a conductive trace.
38. (original) The memory device of claim 33, wherein each source-line contact extends through at least one source region.
39. (original) The memory device of claim 38, wherein each source-line contact extends through only one source region.

40. (withdrawn) The memory device of claim 33, wherein each floating-gate memory cell having a control-gate layer coupled to the same word line also shares the same source-line contact.
41. (currently amended) A floating-gate memory cell, comprising:
a gate stack having a control-gate layer and having a floating-gate layer
interposed between the control-gate layer and a well region having a first conductivity type, wherein the well region having the first conductivity type is isolated from a semiconductor substrate having the first conductivity type by an interposing well region having a second conductivity type different from the first conductivity type;
a first source/drain region having the second conductivity type in the well region having the first conductivity type, wherein the first source/drain region is not coupled to the well region having the second conductivity type; and
a second source/drain region having the second conductivity type in the well region having the first conductivity type, wherein the second source/drain region is coupled to the well region having the second conductivity type.
42. (original) The floating-gate memory cell of claim 41, wherein the well region having the first conductivity type is a p-well and wherein the interposing well region having the second conductivity type is an n-well in a p-type semiconductor substrate.
43. (original) The floating-gate memory cell of claim 41, wherein the well region having the first conductivity type is an n-well and wherein the interposing well region having the second conductivity type is a p-well in an n-type semiconductor substrate.

44. (currently amended) A floating-gate memory cell, comprising:
a gate stack having a control-gate layer and having a floating-gate layer
interposed between the control-gate layer and a p-well, wherein the p-well
is enclosed in an n-well formed in a p-type semiconductor substrate;
a drain region in the p-well, wherein the drain region has an n^+ -type conductivity,
wherein the drain region is isolated from the n-well; and
a source region in the p-well and having the n^+ -type conductivity, wherein the
source region is coupled to the n-well.
45. (currently amended) A floating-gate memory cell, comprising:
a gate stack having a control-gate layer and having a floating-gate layer, wherein
the gate stack is overlying a p-well and wherein the p-well is enclosed in
an n-well formed in a p-type semiconductor substrate;
an n^+ -type drain region in the p-well;
an n^+ -type source region in the p-well; and
a source-line contact coupled to the n^+ -type source region and extending below
the n^+ -type source region to the n-well[.];
wherein the n-well serves as a source line to the floating-gate memory cell.
46. (currently amended) A floating-gate memory cell, comprising:
a gate stack having a control-gate layer and having a floating-gate layer, wherein
the gate stack is overlying a p-well and wherein the p-well is enclosed in
an n-well formed in a p-type semiconductor substrate;
an n^+ -type drain region in the p-well and isolated from the n-well;
an n^+ -type source region in the p-well; and
a source-line contact extending from the n^+ -type source region to the n-well.
47. (withdrawn) The floating-gate memory cell of claim 46, wherein the source-line
contact extends from multiple n^+ -type source regions to the n-well.

48. (original) The floating-gate memory cell of claim 46, wherein the source-line contact extends from only one n^+ -type source region to the n-well.

49-53. (canceled)

54. (currently amended) A floating-gate memory cell, comprising:
a tunnel dielectric layer overlying an upper well region, wherein the upper well region has a p-type conductivity;
a floating-gate layer overlying the tunnel dielectric layer;
an intergate dielectric layer overlying the floating-gate layer;
a control-gate layer overlying the intergate dielectric layer;
a drain region in the upper well region, wherein the drain region has an n^+ -type conductivity; and
a source region in the upper well region and having the n^+ -type conductivity, wherein the source region is coupled to a lower well region underlying the upper well region;
wherein the lower well region has an n-type conductivity; [[and]]
wherein the lower well region is formed in a semiconductor substrate having the p-type conductivity[[]]; and
wherein the lower well region is adapted to function as source line to the floating-gate memory cell.

55. (withdrawn) The floating-gate memory cell of claim 54, wherein the source region is coupled to the lower well region through a source-line contact as a columnar trench of conductive fill material.

56. (withdrawn) The floating-gate memory cell of claim 55, further comprising a conductive trace coupled between the source region and the source-line contact.

57. (withdrawn) The floating-gate memory cell of claim 54, wherein the source region is coupled to the lower well region through a source-line contact as an extended trench of conductive fill material and wherein the extended trench of conductive fill material is coupled to source regions of other floating-gate memory cells.
58. (currently amended) A memory device, comprising:
- a substrate having a p-type conductivity;
 - a lower well region formed in the substrate, wherein the lower well region has an n-type conductivity;
 - an upper well region formed in the lower well region, wherein the upper well region has the p-type conductivity;
 - a plurality of word lines;
 - a plurality of bit lines; and
 - a plurality of floating-gate memory cells, wherein each floating-gate memory cell comprises:
 - a control-gate layer for coupling to one of the plurality of word lines;
 - a floating-gate layer interposed between the control-gate layer and the upper well region;
 - a drain region in the upper well region for coupling to one of the plurality of bit lines, wherein the drain region has an n^+ -type conductivity and is isolated from the lower well region;
 - a source region in the upper well region, wherein the source region has the n^+ -type conductivity; and
 - a source-line contact extending below the source region to the lower well region, wherein the source-line contact is coupled to the source region.

59. (withdrawn) The memory device of claim 58, wherein each source-line contact is laterally displaced from each source region and wherein each source-line contact is coupled to at least one source region.
60. (withdrawn) The memory device of claim 59, wherein each source-line contact is coupled to the at least one source region through a conductive trace.
61. (original) The memory device of claim 58, wherein each source-line contact extends through at least one source region.
62. (original) The memory device of claim 61, wherein each source-line contact extends through only one source region.
63. (withdrawn) The memory device of claim 58, wherein each floating-gate memory cell having a control-gate layer coupled to the same word line also shares the same source-line contact.
64. (currently amended) An electronic system, comprising:
a processor; and
a memory device coupled to the processor, wherein the memory device includes
an array of floating-gate memory cells arranged in rows and columns with word lines coupled to rows of floating-gate memory cells and bit lines coupled to columns of floating-gate memory cells, and wherein at least one of the floating-gate memory cells comprises:
a gate stack having a control-gate layer coupled to a word line and having a floating-gate layer interposed between the control-gate layer and a first semiconductor region having a first conductivity type;
a drain region in the first semiconductor region coupled to a bit line, wherein the drain region has a second conductivity type different from the first conductivity type; and

a source region in the first semiconductor region and having the second conductivity type;

wherein the source region is coupled to a second semiconductor region underlying the first semiconductor region and the drain region is isolated from the second semiconductor region;

wherein the second semiconductor region has the second conductivity type; and

wherein the second semiconductor region isolates the first semiconductor region from other semiconductor regions having the first conductivity type.

65. (currently amended) An electronic system, comprising:

a processor; and

a memory device coupled to the processor, wherein the memory device comprises:

a substrate having a first conductivity type;

a lower well region in the substrate, wherein the lower well region has a second conductivity type different from the first conductivity type;

an upper well region in the lower well region, wherein the upper well region has the first conductivity type;

a plurality of word lines;

a plurality of bit lines;

an array of floating-gate memory cells, wherein each floating-gate memory cell comprises:

a control-gate layer for coupling to one of the plurality of word lines;

a floating-gate layer interposed between the control-gate layer and the upper well region;

a drain region in the upper well region for coupling to one of the plurality of bit lines, wherein the drain region has the second conductivity type;

a source region in the upper well region, wherein the source region has the second conductivity type; and

a source-line contact extending below the source region to the lower well region, wherein the source-line contact is coupled to the source region; and

a plurality of data lines coupled between the array of floating-gate memory cells and the processor[.];

wherein the lower well region is adapted to function as a common source line to the array of floating-gate memory cells.

66-110. (canceled)